

TSG-RAN Working Group 1 meeting #11
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Agenda item: AH 4 / AH 8 / AH 16

Source: Nokia

Title: CR 25.215-036 rev3: Clarification of compressed mode parameters

Document for: Decision

This CR includes the changes introduced in CR 25.215-022 and CR 25.215-032 plus some additional clarifications.

For doing some measurements, e.g. FDD-FDD interfrequency cell search, the transmission gap distance (TGD) has to be set to fractions of full frames to provide optimum performance. Thus, it is proposed to change it to number of slots instead number of frames. A note about the limitations of gap positions has been added.

It was not clearly stated that the numeric values are integers. This has been added.

In addition, a major rewrite of section 6.1.1.2 was done to provide consistent definitions of the compressed mode parameters.

Some parameters were listed twice, once in a section describing a gap, then again when describing a pattern. This has been simplified and redundancy removed.

Some unities had the same name as their duration. This has been fixed.

There were some leftover statements about fixed and flexible gap positions. As this is not dependant on the number of gaps, but simply considered a parameter, these sentences were removed.

CR 25.215-022 introduced the possibility to use two transmission gap lengths defined by parameters TGL1 and TGL2. This has been included.

Figure 1 has been redrawn to reflect all changes.

Finally, “upper layers” is replaced by “higher layers” as this is the usual term.

Revision 2 includes the following changes compared to revision 1:

- Duplicate sequence definition removed
- CFN renamed to TGCFN
- word “sequence” added to clarify the per-sequence-parameters
- PCM renamed to RPP (recovery period power control mode)
- PRM renamed to ITP (initial transmit power control mode)
- TGSN clarified to be the first slot of the gap, definition of “1st CM frame” added
- parameter TGPSI added to address the [8] different sequences
- Measurement purpose added
- PR renamed to TGPRC

Revision 3 adds the following changes:

- TGPSI removed, as it is seen outside the scope of WG1
- Figure 1 updated to show that TGSN is the number of the 1st slot of the CM gap, not the number of slots before the gap (the descriptive text was correct)

It is proposed that WG1 informs WG2/WG3 that a parameter identifying the transmission gap pattern sequences might be helpful for starting, stopping and reconfiguring particular sequences out of the set of [8] as well as for defining the behaviour in the case when gaps of different sequences overlap.

5.2.8 UTRAN GPS Timing of Cell Frames for LCS

Definition	The timing between cell j and GPS Time Of Week. $T_{\text{UTRAN-GPS}j}$ is defined as the time of occurrence of a specified UTRAN event according to GPS time. The specified UTRAN event is the beginning of a particular frame (identified through its SFN) in the first significant multipath of the cell j CPICH, where cell j is a cell within the active set.
Applicable for	Connected Intra, Connected Inter
Range/mapping	The resolution of $T_{\text{UTRAN-GPS}j}$ is $1\mu\text{S}$. The range is from 0 to $6.04 \times 10^{11} \mu\text{S}$.

6 Measurements for UTRA FDD

6.1 UE measurements

6.1.1 Compressed mode

6.1.1.1 Use of compressed mode/dual receiver for monitoring

A UE shall, on ~~upper~~ higher layers commands, monitor cells on other frequencies (FDD, TDD, GSM). To allow the UE to perform measurements, ~~upper~~ higher layers shall command that the UE enters in compressed mode, depending on the UE capabilities.

In case of compressed mode decision, UTRAN shall communicate to the UE the parameters of the compressed mode, ~~described in reference [2], 25.212.~~

A UE with a single receiver shall support downlink compressed mode.

Every UE shall support uplink compressed mode, when monitoring frequencies which are close to the uplink transmission frequency (i.e. frequencies in the TDD or GSM 1800/1900 bands).

All fixed-duplex UE shall support both downlink and uplink compressed mode to allow inter-frequency handover within FDD and inter-mode handover from FDD to TDD.

< WGI's note : the use of uplink compressed mode for single receiver UE when monitoring frequencies outside TDD and GSM 1800/1900 bands is for further study >

UE with dual receivers can perform independent measurements, with the use of a "monitoring branch" receiver, that can operate independently from the UTRA FDD receiver branch. Such UE do not need to support downlink compressed mode.

The UE shall support one single measurement purpose within one compressed mode transmission gap. The measurement purpose of the gap is signalled by ~~upper~~ higher layers.

The following section provides rules to parametrise the compressed mode.

6.1.1.2 Parameterisation of the compressed mode

~~In response to a request from upper layers, the UTRAN shall signal to the UE the compressed mode parameters.~~

~~The following parameters characterize a transmission gap :~~

- ~~— TGL: Transmission Gap Length is the duration of no transmission, expressed in number of slots.~~
- ~~— SFN: The system frame number when the transmission gap starts~~
- ~~— SN: The slot number when the transmission gap starts~~

With this definition, it is possible to have a flexible position of the transmission gap in the frame, as defined in [2].

The following parameters characterize a compressed mode pattern :

- TGP: Transmission Gap Period is the period of repetition of a set of consecutive frames containing up to 2 transmission gaps (*).
- TGL: As defined above
- TGD: Transmission Gap Distance is the duration of transmission between two consecutive transmission gaps within a transmission gap period, expressed in number of frames. In case there is only one transmission gap in the transmission gap period, this parameter shall be set to zero.
- PD: Pattern duration is the total time of all TGPs expressed in number of frames.
- SFN: The system frame number when the first transmission gap starts
- UL/DL compressed mode selection: This parameter specifies whether compressed mode is used in UL only, DL only or both UL and DL.
- Compressed mode method: The method for generating the downlink compressed mode gap can be puncturing, reducing the spreading factor or upper layer scheduling and is described in [2].
- Transmit gap position mode: The gap position can be fixed or adjustable. This is defined in [2].
- Downlink frame type: This parameter defines if frame structure type 'A' or 'B' shall be used in downlink compressed mode. This is defined in [2].
- Scrambling code change: This parameter indicates whether the alternative scrambling code is used for compressed mode method 'SF/2'. Alternative scrambling codes are described in [3].
- PCM: Power Control Mode specifies the uplink power control algorithm applied during recovery period after each transmission gap in compressed mode. PCM can take 2 values (0 or 1). The different power control modes are described in [4].
- PRM: Power Resume Mode selects the uplink power control method to calculate the initial transmit power after the gap. PRM can take two values (0 or 1) and is described in [4].

In a compressed mode pattern, the first transmission gap starts in the first frame of the pattern. The gaps have a fixed position in the frames, and start in the slot position defined in [2].

- (*): Optionally, the set of parameters may contain 2 values TGP1 and TGP2, where TGP1 is used for the 1st and the consecutive odd gap periods and TGP2 is used for the even ones. Note if TGP1=TGP2 this is equivalent to using only one TGP value.

In all cases, upper layers has control of individual UE parameters. The repetition of any pattern can be stopped on upper layers command.

The UE shall support [8] simultaneous compressed mode patterns which can be used for different measurements. Upper layers will ensure that the compressed mode gaps do not overlap and are not scheduled within the same frame. Patterns causing an overlap or too long gaps will not be processed by the UE and interpreted as a faulty message.

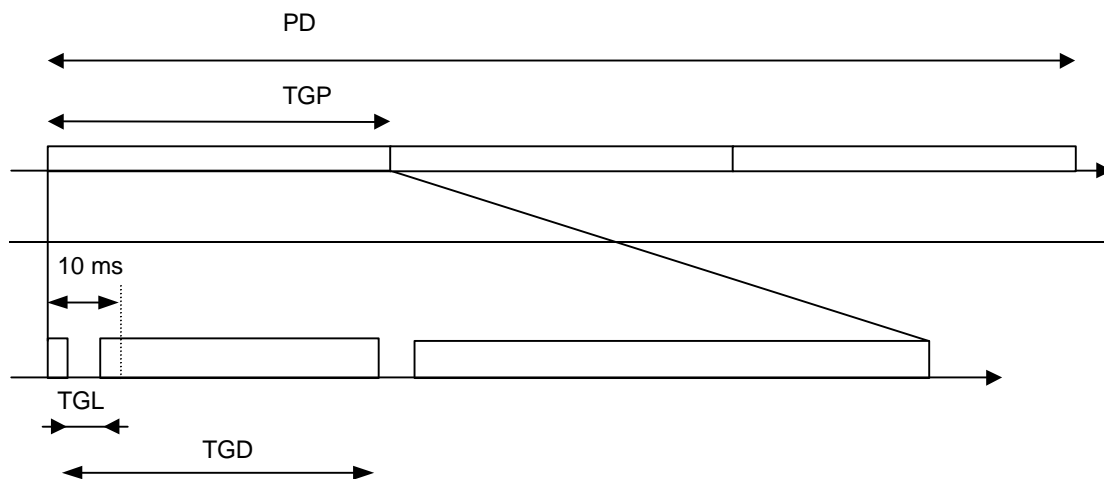


Figure 1 : illustration of compressed mode pattern parameters

In response to a request from higher layers, the UTRAN shall signal to the UE the compressed mode parameters.

A transmission gap pattern sequence consists of alternating transmission gap patterns 1 and 2, each of these patterns in turn consists of one or two transmission gaps. See figure 1.

The following parameters characterize a transmission gap pattern:

- TGSN (Transmission Gap Starting Slot Number): A transmission gap pattern begins on a radio frame, thereafter called first radio frame of the transmission gap pattern, containing at least one transmission gap slot. TGSN is the slot number of the first transmission gap slot within the first radio frame of the transmission gap pattern
- TGL1 (Transmission Gap Length 1): This is the duration of the first transmission gap within the transmission gap pattern, expressed in number of slots.
- TGL2 (Transmission Gap Length 2): This is the duration of the second transmission gap within the transmission gap pattern, expressed in number of slots. If this parameter is not explicitly set by higher layers, then $TGL2 = TGL1$.
- TGD (Transmission Gap Distance): This is the duration of transmission between two consecutive transmission gaps within a transmission gap pattern, expressed in number of slots. The resulting position of the second gap within its radio frame(s) shall comply with the limitations of [2]. If this parameter is not set by higher layers, then there is only one transmission gap in the transmission gap pattern.
- TGPL1 (Transmission Gap Pattern Length): This is the duration of transmission gap pattern 1.
- TGPL2 (Transmission Gap Pattern Length): This is the duration of transmission gap pattern 2. If this parameter is not explicitly set by higher layers, then $TGPL2 = TGPL1$.

The following parameters control the transmission gap pattern sequence start and repetition:

- TGPRC (Transmission Gap Pattern Repetition Count): This is the number of transmission gap patterns within the transmission gap pattern sequence.
- TGCFN (Transmission Gap Connection Frame Number): This is the CFN of the first radio frame of the first pattern 1 within the transmission gap pattern sequence.

In addition to the parameters defining the positions of transmission gaps, each transmission gap pattern sequence is characterized by:

- UL/DL compressed mode selection: This parameter specifies whether compressed mode is used in UL only, DL only or both UL and DL.
- Compressed mode method: The method for generating the downlink compressed mode gap can be puncturing, halving the spreading factor or higher layer scheduling and is described in [2].

- Transmit gap position mode: The gap position can be fixed or adjustable. This is defined in [2].
- Downlink frame type: This parameter defines if frame structure type 'A' or 'B' shall be used in downlink compressed mode. This is defined in [2].
- Scrambling code change: This parameter indicates whether the alternative scrambling code is used for compressed mode method 'SF/2'. Alternative scrambling codes are described in [3].
- RPP: Recovery Period Power control mode specifies the uplink power control algorithm applied during recovery period after each transmission gap in compressed mode. RPP can take 2 values (0 or 1). The different power control modes are described in [4].
- ITP: Initial Transmit Power mode selects the uplink power control method to calculate the initial transmit power after the gap. ITP can take two values (0 or 1) and is described in [4].
- TGMP: Transmission Gap pattern sequence Measurement Purpose: This parameter defines the purpose this transmission gap pattern sequence is intended for. Values are [TBD].

The UE shall support [8] simultaneous compressed mode pattern sequences which can be used for different measurements.

Higher layers will ensure that the compressed mode gaps do not overlap and are not scheduled to overlap the same frame. The behaviour when an overlap occurs is described in [TS 25.302].

In all cases, higher layers have control of individual UE parameters. Any pattern sequence can be stopped on higher layers' command.

The parameters TGSN, TGL1, TGL2, TGD, TGPL1, TGPL2, TGPRC and TGCFN shall all be integers.

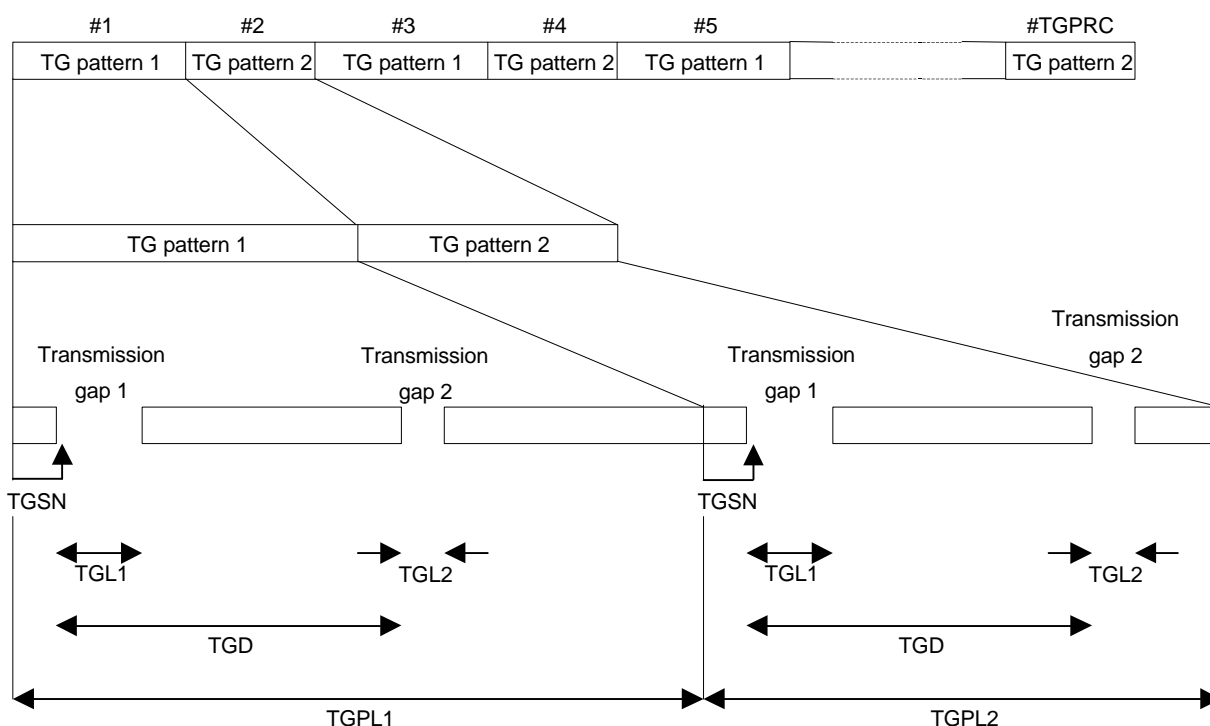


Figure 1: Illustration of compressed mode pattern parameters

6.1.1.3 Parameterisation limitations

In the table below the supported values for the TGL1 and TGL2 parameters ~~is~~ are shown.

Measurements performed on	Supported TGL1 values, when TGL2 is not set	Supported TGL1 and TGL2 values when both are set (TGL1, TGL2)
FDD inter-frequency cell	7, 14	(10, 5)
TDD cell	4	-
GSM cell	3, 4, 7, 10, 14	-

Multi-mode terminals shall support ~~the union of~~ all TGL1 and TGL2 values for the supported modes.

Further limitations on the transmission gap position ~~is~~ within its frame(s) are given in TS 25.212.